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Effect of Plant Growth Promoting Rhizobacteria (PGPR) on the Growth and Yield of Rice Plants (*Oryza sativa* L.)

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Abstract
Background. The main agricultural product that yields rice as a primary food source in Indonesia is rice plants (Oryza sativa L.). This crop is vital for fulfilling the country's food demands. A significant challenge to achieving food security and independence nationally is the reduction in productivity, which results from soil fertility loss due to the overuse of chemical fertilizers.
Aims. To address these challenges, strategies have been put in place, such as incorporating organic materials and utilizing soil microbes, which can be included in contemporary agricultural practices. The use of Plant Growth Promoting Rhizobacteria (PGPR) is one method to enhance plant growth. This study aimed to investigate the influence of PGPR on the growth and yield of rice plants (Oryza sativa L).
Methods. The study was conducted from April to August 2025 in Babadan Village, located within Cirebon Regency in West Java. The experimental design utilized a Group Random Design (RAK) featuring six different PGPR concentrations, tested four times, resulting in 24 experimental plot units: P0 (control), P1 (5 ml/l), P2 (10 ml/l), P3 (15 ml/l), P4 (20 ml/l), and P5 (25 ml/l). Observations included various metrics such as plant height, number of sprouts in each clump, leaf area, root volume, plant growth rate (LPT), number of productive sprouts per clump, length of panicles, total grains per panicle, the percentage of filled grains per clump, weight of filled grains per clump, weight of 1,000 grains, total weight of harvested dry grains per clump, total weight of harvested dry grains per plot, and weight of milled dry grains per plot.
Result. The findings indicated that PGPR positively affected multiple growth and yield characteristics. Specifically, PGPR application significantly influenced plant height, root volume, the number of panicles per clump, length of panicles per clump, grains per panicle, the percentage of grains per clump, weight of grains per clump, weight of 1,000 grains, weight of harvested dry grains (GKP) per clump, weight of GKP per plot, and weight of milled dry grains (GKG) per plot.
Conclusion. The highest yields of harvested dry grains (GKP) and milled dry grains (GKG) per plot occurred with the PGPR treatment at a concentration of 15 ml/l, resulting in 6. 13 kg and 5. 81 kg, respectively.
Implementation. Farmers in Babadan Village can adopt the PGPR treatment at a concentration of 15 ml/l.

Keywords: Rice, PGPR, Growth, Yield

INTRODUCTION

Rice plants (Oryza sativa L.) are a key agricultural commodity that produces rice, a staple food widely cultivated in Indonesia. This crop plays a crucial role in meeting domestic food demands. This aligns with the rising rice consumption levels in Indonesia, which continue to grow in order to satisfy the overall food needs of the population. (Nurhidayat et al. , 2024).

According to a report by BPS (2025), it is anticipated that in 2024, Indonesia will produce 53. 14 million tons of unhusked rice, a decline of 1. 55% or 838. 27 thousand tons compared to 2023, where the rice production was equivalent to 30. 62 million tons, representing a decrease of 480. 04 thousand tons from the previous year. Based on this rice production data, Indonesia is still unable to meet market demand, and the national rice supply is not fully supported by domestic production, leading the government to import rice from other countries. (Putranto, 2023). The reduction in production is exacerbated by the conversion of agricultural land and the decline in soil fertility due to excessive chemical fertilizer use. This situation presents a significant challenge for achieving national food independence and security. Soil fertility is vital for crop productivity, as it helps maintain organic matter in the soil at around 2% (Handayanto et al. , 2017).

One practice that can be adopted in modern agriculture is the use of organic materials and soil microbes. The application of PGPR (Plant Growth Promoting Rhizobacteria) represents a practical approach to enhance plant growth. PGPR refers to a group of bacteria that can stimulate growth through various mechanisms due to their colonization of root areas (Nasib et al. , 2016). PGPR acts as biostimulants that can promote plant growth by synthesizing and regulating various growth regulators (phytohormones) like cytokinins, gibberellins, and indole acetic acid (IAA) in the root environment (Subari et al. , 2024). PGPR serves as a biostimulant that can encourage plant growth via biofertilization, enhancing root development, root remediation, and stress management. Microbial types that fall under the PGPR category include Azobacter sp. , Pseudomonas sp. , Azospirillum sp. , Acetobacter sp. , and Bacillus sp. (Patading and Ai, 2021). Bacteria such as Azospirillum and Pseudomonas are known to contribute to the enhancement of root system growth, increase leaf area, and boost the number of rice seedlings.

Research conducted in 2024 demonstrates that using a PGPR concentration of 10 ml/l influences flowering time, grain count, and weight. Furthermore, a study by Permadi et al. revealed that a PGPR application at a concentration of 15 ml/l significantly increased plant height, resulted in the highest number of seedlings, and provided optimal yields. This is consistent with the views of Nafiah and Suryanto (2019), which indicate that PGPR can affect the availability of nutrients that plants can absorb, thus supporting growth processes and maximizing nutrient uptake, while also enhancing the yield weight of dry rice per plot. Similar findings were also reported by Fajariyani and Sumarni (2019), who noted that PGPR plays a significant role in supporting the plant photosynthesis process, where the results of this photosynthesis yield assimilates used for seed filling, thereby increasing the weight of the dry unhusked rice (GKG).

METHOD

This experiment was conducted in the village of Babadan, Plered District, Cirebon Regency from May to August 2025. The tools utilized for this experiment included a hand sprayer, containers, a scale, a measuring cup, and writing utensils. The materials involved were seeds of the Inpari 32 rice cultivar, Urea, Phonska, NPK Mutiara, PGPR, Furadan, and pesticides. The experimental method employed a Randomized Block Design (RBD) with six treatments, each repeated four times, resulting in 24 experimental units: P0 (control), P1 (5 ml/l), P2 (10 ml/l), P3 (15 ml/l), P4 (20 ml/l), and P5 (25 ml/l). Treatments were administered three times on the 5th, 12th, and 19th days after planting.

The experiment commenced with the preparation of a plot measuring 2 meters by 3 meters, spaced 20 centimeters apart for mapping and 30 centimeters between repetitions. Each plot consisted of 96 clumps, with two seedlings planted in each hole, maintaining a planting distance of 25 centimeters by 25 centimeters. Observations included plant height, number of seedlings, leaf area, plant growth rate, root volume, number of productive tillers per clump, panicle length, seeds per panicle, filled grain percentage per clump, filled grain weight per clump, weight of 1,000 seeds, harvested dry grain weight (GKP) per clump, harvested dry grain weight (GKP) per plot, and milled dry grain weight (GKG) per plot. Data from the study were analyzed using ANOVA (F test). If the analysis indicated a significant effect, further testing was conducted using Duncan's Multiple Range Test (DMRT) at a 5% significance level.

DISCUSSION

Plant Height (cm)

PGPR has a positive impact on plant growth, both directly and indirectly, especially in terms of plant height. Based on the results of variety analysis, treatment with PGPR was proven to affect the height of rice plants at 21, 35, and 49 days after planting (HST). Data on plant height can be seen in Table 1.

Table 1. Plant Height Age 21, 35 and 49 HST

Yes	Treatment	Plant Height (cm)		
		21 HST	35 HST	49 HST
1	P0 (0 ml/liter)	55.67 A	82.20 A	94.89 A
2	P1 (5 ml/liter)	57.31 ab	86.52 bc	100.75 bc
3	P2 (10 ml/liter)	59.11 c	87.39 BC	102.71 bc
4	P3 (15 ml/liter)	59.57 c	87.79 c	105.19 c
5	P4 (20 ml/liter	56.75 ab	83.90 ab	99.94 ABC
6	P5 (25 ml/liter)	55.82 A	83.86 ab	98.21 ab

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

According to the information presented in Table 1, the tallest rice plants were observed in the P3 treatment at 49 days after planting, reaching an average height of 105. 19 cm. This phenomenon is thought to arise because PGPR can fulfill essential nutritional requirements crucial for the growth of rice plants, which in turn enhances the growth process and plant development. PGPR serves as an energy provider, allowing plants to develop more effectively during the vegetative stage and leading to greater plant height.

Number of Saplings per Clump (fruit)

The outcomes of the variance analysis indicated that the PGPR treatment did not significantly influence the count of saplings per rice plant at the 21, 35, and 49 days post-planting (HST). The information presented in Table 2 reveals that although there is a noticeable rise in the number of saplings, the statistical difference is not noteworthy. This situation is likely due to the stabilization of sapling production during the initial vegetative stage. Furthermore, external environmental factors also contribute to the stability of sapling growth in rice plants. These results are consistent with the findings of Harahap et al. (2022), which indicated that PGPR can enhance the number of saplings in the early vegetative stage; however, this enhancement doesn't always lead to a statistically significant change.

Table 2 Number of Saplings per Clump

Yes	Treatment	Number of Saplings (fruit)		
		21 HST	35 HST	49 HST
1	P0 (0 ml/liter)	20.85 to	28.70 to	30.25 to
2	P1 (5 ml/liter)	25.35 to	33.40 to	34.38 to
3	P2 (10 ml/liter)	26.10 to	33.95 to	34.50 to
4	P3 (15 ml/liter)	26.60 to	34.15 to	36.88 to
5	P4 (20 ml/liter	24.90 to	32.95 to	33.88 to
6	P5 (25 ml/liter)	24.40 to	31.95 to	32.88 to

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

Leaf Area (cm^2)

The results of the variety analysis showed that PGPR had no effect on the leaf area of rice plants at the ages of 21 HST, 35 HST, and 49 HST, as presented in Table 3.

Table 3. Yield Leaf Area

Yes	Treatment	Leaf Area (cm2)		
		21 HST	35 HST	49 HST
1	P0 (0 ml/liter)	15.22 to	54.13 to	67.28 A
2	P1 (5 ml/liter)	24.35 to	67.08 a	79.08 a
3	P2 (10 ml/liter)	24.45 to	71.10 to	79.85 A
4	P3 (15 ml/liter)	28.20 to	73.41 to	89.50 to
5	P4 (20 ml/litre)	20.80 to	66.26 a	77.75 to
6	P5 (25 ml/liter)	20.73 to	64.90 to	76.08 to

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

According to the information presented in Table 3, it is evident that different levels of PGPR did not notably influence the leaf area of rice plants at any of the ages observed. It is believed that genetic characteristics and environmental factors are more influential in shaping leaf area than the PGPR treatment.

Root Volume

The results of the variety analysis showed that the administration of PGPR had a real effect on the root volume at the ages of 21, 35, and 49 HST. Root volume observation data are presented in the table below.

Table 4. Root Volume Results

Yes	Treatment	Root Volume (ml)		
		21 HST	35 HST	49 HST
1	P0 (0 ml/liter)	8.80 to	13.50 to	16.00 to
2	P1 (5 ml/liter)	13.50 bc	15.80 to	7:30 p.m. AB
3	P2 (10 ml/liter)	14.00 c	17.00 b	20.00 b
4	P3 (15 ml/liter)	2.30 p.m.	17.30 b	21.00 c
5	P4 (20 ml/liter	12.80 BC	14.00 to	17.80 AB
6	P5 (25 ml/liter)	11.30 a.m.	13.00 to	16.50 to

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5%.

According to the information presented in Table 4, it is evident that the application of PGPR has a notable impact on the root volume of rice plants across all observation periods. On the 49th day following planting, the P3 treatment recorded the greatest root volume, averaging 21. 00 ml. This is attributed to PGPR's capability to enhance both root growth and branching by producing the IAA hormone, which contributes to improved water and nutrient uptake. This observation aligns with the claims made by Purwanto et al. (2021), who noted that PGPR usage can enhance root growth and biomass in rice plants. Essentially, PGPR is crucial for fostering root development and the overall health of rice crops.

Plant Growth Rate (LPT)

The results of the variety analysis showed that the application of PGPR did not have a significant effect on the growth rate of plants, as can be seen in the table 5below.

According to Table 5, the findings indicated that the use of PGPR did not significantly influence the rate of plant growth (LPT). It is believed that the beneficial impact of PGPR on rice development mainly happens during the early stages and the vegetative period, as seen in the rise of seedling height and the weight of dry grains, which contributes to the enhancement of LPT until it achieves its best level. The information presented in the table shows that the

LPT value increased in the P3 treatment but then dropped in the P4 and P5 treatments. This suggests that there are optimal concentrations of PGPR and beneficial interactions with other variables, such as the age of the plants or the amount of fertilizer used, where using too much or incorrect dosages may lessen their effectiveness.

Table 5. Plant Growth Rate (LPT)

Yes	Treatment	LPT (g/day)	
		21-35 HST	35-49 HST
1	P0 (0 ml/liter)	0.0697 to	0.0269 A
2	P1 (5 ml/liter)	0.0779 A	0.0352 A
3	P2 (10 ml/liter)	0.0800 A	0.0563 to
4	P3 (15 ml/liter)	0.0821 A	0.0392 A
5	P4 (20 ml/liter	0.0711 A	0.0420 A
6	P5 (25 ml/liter)	0.0710 A	0.0301 A

Information: The average value followed by the same letter in the same column shows that there is no real difference based on the Duncan Test of 5%.

Number of Panicles per Clump

The results of data analysis showed that the administration of PGPR had a real effect on the number of panicles in rice plants. As can be seen in Table 6 below.

Table 6. Number of Panicles per Clump

Yes	Treatment	Number of Panicles (fruit)
1	P0 (0 ml/liter)	21.08 to
2	P1 (5 ml/liter)	22.25 AB
3	P2 (10 ml/liter)	22.58 AB
4	P3 (15 ml/liter)	23.42 b
5	P4 (20 ml/litre)	9.58 p.m.
6	P5 (25 ml/liter)	9:33 p.m.

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

Table 6 shows that the highest quantity of panicles was achieved with the PGPR application in the P3 treatment (15 ml/l), averaging 23. 42 panicles. Despite this, the variance was not statistically meaningful compared to the P1 (5 ml/l) and P2 (10 ml/l) treatments. Furthermore, higher concentrations of PGPR resulted in a reduction in the number of panicles produced. Using PGPR at levels between 5-15 ml/l can enhance the nutrient availability for plants, which in turn can lead to an increase in panicle count. According to Shailendra Singh (2015), Azotobacter and Azospirillum are nitrogen-fixing bacteria that supply nitrogen to plants. Additionally, Bacillus functions as a phosphorus solubilizer, facilitating better phosphorus uptake by plants. Moreover, PGPR from Pseudomonas spp. has the ability to generate hormones like IAA, gibberellin, cytokinin, and auxin, which are crucial for promoting growth and increasing panicle numbers.

Panicle Length per Clump

The application of PGPR facilitates the absorption of nutrients in the soil by plants through the process of mineralization and transformation, which is believed to provide phosphorus to support plant metabolism. In addition, the application of PGPR has also been shown to have a significant effect on the length of rice panicles, as seen in Table 7.

Table 7. Yield of Length of Panicles per Clump

Yes	Treatment	Panicle Length (cm)
1	P0 (0 ml/liter)	9:49 p.m.
2	P1 (5 ml/liter)	22.43 b
3	P2 (10 ml/liter)	23.33 c
4	P3 (15 ml/liter)	23.78 c
5	P4 (20 ml/litre)	22.66 b
6	P5 (25 ml/liter)	22.09 b

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

Based on Table 7, it can be seen that the administration of PGPR treatment P2 (10 ml/l) and P3 (15 ml/l) gave the most extended panicle length with an average of 23.33 cm and 23.78 cm, while the shortest panicle length occurred pa at P0 (without PGPR) with an average of 21.49 cm.

Number of Grains per Panicle

The results of the variety-based analysis showed that the administration of PGPR had a significant effect on the number of grains per panicle, as shown in Table 8.

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Table 8. Number of Grains per Panicle (grain)

Yes	Treatment	Number of Grains per Panicle (grain)
1	P0 (0 ml/liter)	122.9 to
2	P1 (5 ml/liter)	166.2 b
3	P2 (10 ml/liter)	172.0 b
4	P3 (15 ml/liter)	180.3 b
5	P4 (20 ml/litre)	155.5 ab
6	P5 (25 ml/liter)	142.7 ab

Information : The average value followed by the same letter in the same column shows that there is no real difference based on the Duncan Test of 5%.

Table 8 indicates that using PGPR at levels of P1 (5 ml/l), P2 (10 ml/l), and P3 (15 ml/l) results in a considerable quantity of grain per panicle. However, there was no notable difference in these treatments when compared to P4 (20 ml/l) and P5 (25 ml/l). This aligns with Kaur and Gera's (2016) assertion that PGPR aids in nutrient absorption and enhances their availability for plants, thus contributing to the increased grain yield per panicle. It is thought that PGPR can effectively utilize organic materials present in the soil, reinforcing its role as a beneficial microorganism that promotes plant growth and productivity.

Percentage of Grain Contents per Clump (%)

Based on the results of the variety, it is shown that the application of PGPR affects the percentage of grain content per clump.

Table 9. Yield of Grain Percentage Contents per Clump

Yes	Treatment	Percentage of grain content (%)
1	P0 (0 ml/liter)	93.34 A
2	P1 (5 ml/liter)	96.47 AB
3	P2 (10 ml/liter)	96.83 b
4	P3 (15 ml/liter)	97.51 b
5	P4 (20 ml/litre)	96.16 AB
6	P5 (25 ml/liter)	95.47 ab

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

According to the information presented in Table 9, the proportion of grain per clump with elevated yields was observed in the P2 (10 ml/l) and P3 (15 ml/l) treatments, which were noted at 96. 47% and 97. 51%, respectively. Nevertheless, these figures did not exhibit significant variances when compared to the P1, P4, and P5 treatments. This aligns with the observations made by Shailendra Singh (2015) and Zhou et al. (2016), who noted that PGPR not only promotes plant development but also plays a crucial role in hastening composting and enhancing crop productivity. PGPR facilitates plant growth by producing hormones like IAA, cytokinin, ethylene, and gibberellic acid, in addition to its functions in nitrogen fixation, phosphorus solubilization, nutrient and water absorption, and potassium solubilization.

Weight of Grain Contents per Clump (grams)

The results of the variety analysis showed that the application of PGPR had a significant effect on the grain weight per clump. PGPR treatment with a concentration of 15 ml/liter (P3) showed the most critical impact, with the average weight of grain content per clump reaching 92.18 grams.

Table 10. Weight of Grain Contents per Clump (grams)

Yes	Treatment	Grain per clump (gram)
1	P0 (0 ml/liter)	67.82 to
2	P1 (5 ml/liter)	78.25 AB
3	P2 (10 ml/liter)	82.43 ab
4	P3 (15 ml/liter)	92.18 b
5	P4 (20 ml/litre)	75.04 AB
6	P5 (25 ml/liter)	72.80 ab

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

According to Table 10, the application of PGPR at a rate of 15 ml/l (P3) results in a greater weight of grain per cluster, measuring 92. 18 grams, and this is notably distinct from the results observed without PGPR. However, the P3 treatment does not show a significant difference when compared to the P1, P2, P4, and P5 treatments. This suggests that a concentration of 15 ml/l offers the best effect in contrast to concentrations that are either too low or too high.

Weight 1,000 Grains (grams)

The findings from the variety analysis indicated that using PGPR significantly impacted the weight of 1,000 rice grains. According to the information in Table 11, the greatest weight for 1,000 grains was recorded in the P3 group (15 ml/l), averaging 28. 43 grams, although it did not differ significantly from the P2 group (10 ml/l). This aligns with Amaliya Ika's assertion from 2019 that Azotobacter is a microorganism capable of enhancing nitrogen availability in the soil. These results suggest that PGPR at a concentration of 15 ml/l effectively enhances the quality of the grains, making them denser and fuller. The positive effect is likely attributed to the presence of Azotobacter bacteria in PGPR, which aids in boosting nitrogen levels in the soil. Sufficient nitrogen availability promotes healthier growth in rice plants, leading to optimal grain filling. In contrast, the other treatments including P0, P1, P2, P4, and P5 exhibited similar weights, with some not showing a significant difference from P0. This further supports the conclusion that a concentration of 15 ml/l is the most effective dose for improving grain weight in this research.

Table 11. Yield Weight 1,000 grains (grams)

Yes	Treatment	Weight 1,000 grains (g)
1	P0 (0 ml/liter)	26.80 to
2	P1 (5 ml/liter)	27.40 AB
3	P2 (10 ml/liter)	27.95 BC
4	P3 (15 ml/liter)	28.43 c
5	P4 (20 ml/litre)	27.03 to
6	P5 (25 ml/liter)	26.90 to

Information : The average value followed by the same letter in the same column shows that there is no real difference based on the Duncan Test of 5%.

Weight of Harvested Dry Grain per Clump (grams)

The results of the variety analysis showed that the application of PGPR had a real effect on the dry weight of the harvest per clump, as seen in Table 12.

Table 12. GKP Weight Results per Clump

Yes	Treatment	GKP weight per clump (g)
1	P0 (0 ml/liter)	71.25 a
2	P1 (5 ml/liter)	83.04 AB
3	P2 (10 ml/liter)	85.72 AB
4	P3 (15 ml/liter)	94.83 b
5	P4 (20 ml/litre)	78.47 AB

6	P5 (25 ml/liter)	75.93 A

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

Table 12 indicates that using PGPR at a concentration of 15 ml/l led to an increased dry weight of each clump in comparison to the P0 and P5 treatments. This is believed to be due to the Bacillus bacteria present in PGPR, which are known to break down and convert phosphorus (P) into a usable form. This assertion is backed by the findings of Anand et al. (2016), who noted that phosphorus is crucial for plant development. The presence of phosphorus in the soil can influence metabolic functions, nitrogen fixation in legumes, the quality of crops, and the plants' ability to resist diseases.

Weight of Harvested Dry Grain per Plot (kg)

The results of the variety analysis showed that the application of PGPR had a real effect on the weight of harvested dry grain per plot, as seen in Table 13.

Table 13. GKP weight result per Plot (kg)

Yes	Treatment	GKP weight per square (kg)
1	P0 (0 ml/liter)	5.71 to
2	P1 (5 ml/liter)	5.74 to
3	P2 (10 ml/liter)	5.99 b
4	P3 (15 ml/liter)	6.13 c
5	P4 (20 ml/litre)	5.73 to
6	P5 (25 ml/liter)	5.72 to

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

According to the information presented in Table 13, using PGPR at a level of 15 ml/l (P3) results in the highest dry grain weight harvested per plot, measuring 6. 13 kg. This outcome aligns with earlier findings concerning the weight of 1,000 grains. The 15 ml/L concentration has shown to be the best dose, as it enhances the total yield significantly. This suggests that PGPR contributes not only to enhancing grain quality and the weight of grains per clump but also positively impacts the overall yield for each plot.

Weight of Milled Dry Grain per Square(kg)

The findings from the fingerprint analysis indicated that using PGPR had a significant impact on the weight of processed dry grain (GKG), as shown in Table 14. The data in this table reveals that the treatment P3 (15 ml/l) resulted in the highest average weight of milled dry grain at 5. 55 kg. This is likely because PGPR at a concentration of 15 ml/l supplies the essential nutrients that rice plants need for improved growth. Fajariyani (2019) notes that PGPR application can enhance the availability of vital nutrients such as nitrogen (N) and phosphorus (P), which are essential for the growth and development of rice plants, ultimately leading to an increase in grain weight.

Table 14. GKG weight per square (kg)

Yes	Treatment	GKG weight per square (kg)
1	P0 (0 ml/liter)	5.30 to
2	P1 (5 ml/liter)	5.59 ab
3	P2 (10 ml/liter)	5.64 BC
4	P3 (15 ml/liter)	5.81 c
5	P4 (20 ml/litre)	5.41 AB
6	P5 (25 ml/liter)	5.31 to

Information: The average value followed by the same letter in the same column indicates that there is no statistically significant difference based on the Duncan Test at a 5% significance level.

This aligns with earlier findings; a concentration of 15 ml/l of PGPR is the best choice since it can enhance overall crop production. This indicates that PGPR may promote the growth and progress of rice, as it probably supplies vital nutrients like nitrogen and phosphorus, which subsequently boost the mass of processed dry grain (GKG).

CONCLUSION

The findings from the research indicated that PGPR positively influenced various growth and yield factors. Using PGPR significantly affects aspects such as plant height, root size, the number of panicles per clump, panicle length per clump, grain count per panicle, grain percentage per clump, clump grain weight, the mass of 1,000 grains, as well as the weights of GKP and GKG per clump and per plot. The treatment with PGPR at a concentration of 15 ml/L resulted in the highest harvest yields of dry grain (GKP) and milled dry grain (GKG) per plot, yielding 6. 13 kg and 5. 81 kg, respectively.

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